UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Signal and Imaging Acquisition and Modelling in Healthcare

2425-1-F9102Q016

Aims

The aim of the course is to provide the physical principles and processing methods underlying biomedical signal and image acquisition systems for the development of artificial intelligence models applied to that support medical decision-making in the prevention, screening, diagnosis and therapy of patients at risk of complex multifactorial diseases.
Theoretical lessons are integrated with practical exercises in the classroom during which datasets of biomedical signals and images will be provided to apply the theoretical principles in the development of artificial intelligence models to support medical decision.

Contents

Physical principles and processing methods of biomedical image and signal acquisition systems for the development of trustworth and explainable artificial intelligence models that support medical decision.

Theoretical lessons integrated with practical exercises in the classroom for the development of artificial intelligence models to support medical decisions.

Detailed program

- Biomedical signals: Electrocardiography / Electroencelography / Electromyography / functional NIRS
- Machine learning and deep learning systems for signal-driven personalized predictive medicine
- Biomedical imaging: ultrasound / radiography / computed tomography / mammography / MRI, mpMRI, fMRI / positron emission tomography / hybrid systems
- Biomedical imaging in image-guided radiotherapy

- Biomedical imaging for lesion detection and semantic segmentation
- Radiomic / radiogenomic modeling for screening and diagnosis
- Radiomic / radiogenomic modeling for treatment
  -Machine learning and deep learning systems for explainable image-guided personalized predictive medicine (supervised / unsupervised learning)

Prerequisites

Medium-High level of programming in Matlab or Python

Teaching form

Lectures and exercises using programming codes.

The teacher gives many lessons in which he begins with a first part in which concepts are exposed (delivery method) and then an interaction opens with the students which defines the next part of the lesson (interactive mode).

- 9 frontal lessons of 2 hours carried out in the delivery mode in presence in the delivery mode in the initial part which is aimed at involving the students
  students interactively in the next part;
- 11 4-hour exercises and 1 2-hour exercise carried out in person aimed at involving students interactively in the PROJECT WORKS;

All activities are carried out in person

Textbook and teaching resource

Notes, software, data and scientific articles provided to students during the course.

Semester

First semester.

Assessment method

The exam consists of an oral interview aimed at verifying the student's level of knowledge of the topics covered during the course and in 2 PROJECT WORKS development projects of 2 programming codes based on the machine learning and deep learning methods presented during the course.

Office hours

At the end of the classroom lesson the teacher is available to receive students for 1 hour

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING